

REMARKS

Claims 1-17 are pending in this application. Reconsideration of the rejections is requested in view of the following remarks.

I. Rejection Under 35 U.S.C. §102(b)

The Office Action rejects claims 1, 4-6, 10-12 and 14-15 under 35 U.S.C. §102(b) as allegedly being anticipated by JP 09-175002 ("Osada"). Applicants respectfully traverse this rejection.

The Patent Office, at section 5, pages 2-3 of the Office Action, alleges that Osada describes a methyl vinyl ether/maleic anhydride copolymer crosslinked with a polyfunctional isocyanate compound. However, Applicants respectfully point out the Patent Office's allegation is incorrect.

For at least the reasons discussed below, Osada fails to describe all the features of claims 1, 6 and 12.

A. Claims 1 And 6

Claims 1 and 6 recite a compound comprising crosslinked resin produced by crosslinking a methyl vinyl ether/maleic anhydride copolymer with a polyfunctional isocyanate compound.

The Office Action asserts, in section 7, that claims 1 and 6 recite product-by-process limitations, and that Osada allegedly describes the same methyl vinyl ether/maleic anhydride copolymer crosslinked with a polyfunctional isocyanate compound recited in claims 1 and 6. This is incorrect.

Applicants enclose herewith English-language translations of paragraphs [0004], [0007], [0009], [0012-0014] and [0016-0018] of Osada cited by the Office Action

("Translation"). As is evident from the enclosed Translation, Osada does not describe a methyl vinyl ether/maleic anhydride copolymer crosslinked with a polyfunctional isocyanate compound.

Instead, Osada describes crosslinking only of polyalkylene oxide resin and isocyanate. Osada, paragraph [0009]. Conversely, claims 1 and 6 recite a methyl vinyl ether/maleic anhydride copolymer crosslinked with a polyfunctional isocyanate compound. The crosslinked product of the present claims is a required structural property of the powder of the composition, and is not a product-by-process limitation. Osada lacks this required structural property as detailed above.

Because Osada fails to describe a methyl vinyl ether/maleic anhydride copolymer crosslinked with a polyfunctional isocyanate compound, Osada does not anticipate claims 1, and 6.

B. Claim 12

Claim 12 recites a method for manufacturing a crosslinked resin, comprising dissolving a methyl vinyl ether/maleic anhydride copolymer in a solvent and adding a polyfunctional isocyanate to perform a crosslinking reaction. As such, claim 12 recites a method for manufacturing a methyl vinyl ether/maleic anhydride copolymer crosslinked with a polyfunctional isocyanate.

As discussed above, with respect to claims 1 and 6, Osada fails to describe a methyl vinyl ether/maleic anhydride copolymer crosslinked with a polyfunctional isocyanate, and thus Osada also fails to describe a method for manufacturing such a compound.

Because Osada fails to describe the method recited in claim 12, Osada does not anticipate claim 12.

C. Conclusion

For at least the reasons discussed above, Osada does not anticipate claims 1, 4-6, 10-12 and 14-15. Accordingly, withdrawal of the rejection is respectfully requested.

II. Rejections Under 35 U.S.C. §103(a)

A. Osada In View Of Koike

The Office Action rejects claims 2-3, 9 and 13 under 35 U.S.C. §103(a) as allegedly being unpatentable over Osada in view of U.S. Patent No. 6,306,414 ("Koike"). Applicants respectfully traverse this rejection.

As discussed above, Osada does not describe the compound in claims 1 and 6 and the method recited in claim 12.

Furthermore, Koike does not remedy the deficiencies of Osada. Koike describes an agricultural aqueous suspension comprising a compound or salt thereof, a condensate of formaldehyde with aromatic sulfonic acid, and an absorptive water-soluble polymer with a specific molecular weight. Koike, column 1, lines 61-67, column 5, lines 42-47, and column 6, lines 17-23. However, Koike does not describe or suggest a composition including a crosslinked methyl vinyl ether/maleic anhydride copolymer, as recited in claims 1 and 6, from which claims 2-3 and 9 depend. Koike also fails to describe a method for manufacturing such a compound as recited in 12, from which claim 13 depends. Thus, Koike fails to remedy the deficiencies of Osada.

Additionally, Osada, alone or in combination with Koike, fails to provide any reason or rationale that would have led one of ordinary skill in the art to have derived crosslinked methyl vinyl ether/maleic anhydride copolymer or a method for manufacturing such a compound.

Therefore, Osada and Koike, whether taken together or independently, fail to render obvious claims 2-3, 9 and 13. Accordingly, withdrawal of the rejection is respectfully requested.

B. Osada In View Of Sato

The Office Action rejects claims 7-8, 16 and 17 under 35 U.S.C. §103(a) as allegedly being unpatentable over Osada in view of JP 2001-351588 ("Sato"). Applicants respectfully traverse this rejection.

For at least the reasons discussed above, Osada does not render obvious independent claims 1 and 6, from which claims 7-8, 16 and 17 depend. Therefore, Osada fails to render obvious claim 7-8, 16 and 17.

Sato does not remedy the deficiencies of Osada. Sato discloses a battery cell pack with a liquid absorption member for absorbing electrolytic solution. Sato, paragraph [0005]. However, Sato does not disclose or suggest a composition including a methyl vinyl ether/maleic anhydride copolymer crosslinked with a polyfunctional isocyanate, as recited in claims 1 and 6.

Additionally, Osada, alone or in combination with Sato, fails to provide any reason or rationale that would have led one of ordinary skill in the art to have derived a compound comprising crosslinked methyl vinyl ether/maleic anhydride copolymer.

Therefore, Osada and Sato, whether taken separately or in concert, fail to render obvious claims 7-8, 16 and 17. Accordingly, withdrawal of the rejection is respectfully requested.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-17 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



James A. Oliff
Registration No. 27,075

Christopher A. Fasel
Registration No. 59,204

JAO:CAF/hs

Enclosure:

English-Language Translation of Osada Paragraphs [0004], [0007], [0009],
[0012-0014] and [0016-0018]

Date: September 11, 2009

OLIFF & BERRIDGE, PLC
P.O. Box 320850
Alexandria, Virginia 22320-4850
Telephone: (703) 836-6400

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English translations of ¶0004, ¶0007, ¶0009, ¶0012 to ¶0014, and ¶0016 to ¶0018 of Reference Osada (JP H09-175002 A1)

[0004] However, there is no recording material that satisfies above all items. Particularly, when a water-based ink is used, a recorded image lacks a water-resisting property, and has a drawback that blurring of the recorded image is caused only by being contact with water or being stored under a highly humid condition. For example, JP S60-171143 A1 and JP S59-207277 A1 disclose a recording material for a water-based ink. The recording material has a substrate and an ink absorption layer provided thereon. The ink absorption layer contains a water-soluble polymer having ionic hydrophilic groups, or a water-soluble substance and a polyhydric alcohol-soluble substance. However, the recording material has an insufficient water-resisting property. In addition, as a method for improving a water-resisting property, JP S56-58869 A1 discloses a method of insolubilizing a water-soluble polymer after ink jet recording an image on a record sheet that is coated with a water-soluble polymer and the like. However, these methods are impracticable. Thus,, it is desired to develop a recording material which has a high ink-absorption-rate, an improved heat-and moisture-resisting property and an improved water-resisting property. Further, in an OHP sheet etc., a transparency of an ink fixing layer is an important, technical subject. Furthermore, regarding a method for manufacturing a recording material for a water-based ink jet recording, currently, a coating method in which an ink fixing layer is formed on a plastic sheet by coating is mainly employed. However, in this case, a coating fluid is desired to have a good transparency and a good storage stability.

[0007]

[Means for Solving the Problem] As a result of extensive studies to solve the above-mentioned technical problems in an ink jet recording material, the

present inventors found that by using a cross-linked polyalkylene oxide resin in combination with a solvent-soluble hydrophilic resin having a good compatibility with the cross-linked polyalkylene oxide resin, a resin composition for a recording material most suitable for water-based ink jet recording can be provided, where the resin composition has a good ink absorption property; a clear picture can be obtained by using the resin composition; the resin composition has a good heat-and moisture-resisting property and a good water-resisting property; an ink fixing layer prepared by using the resin composition has a high transparency; a solvent solubility of the resin composition is good; a transparency of a solution of the resin composition is good; and a storage stability of the resin composition is good. Based on these findings, the present invention has been completed.

[0009]

[Embodiment of the Invention] As a cross-linked polyalkylene oxide resin used in the present invention, a resin obtained by cross-linking a polyalkylene oxide and a diol with an isocyanate compound is preferably used. Further, the resin is preferably used of which a melt viscosity under 170 °C and 50 kg / cm² load is 2000 to 200,000 poise, and a water absorption efficiency (pure water (g) / resin (g)) is 10 to 45 g/g. When a melt viscosity is less than 2000 poise and when a water absorption efficiency exceeds 45 g/g, a heat-and moisture-resisting property and a water-resisting property of a recorded image unpreferably deteriorate. Further, when a melt viscosity exceeds 200,000 poise and when a water absorption efficiency is less than 10 g/g, a compatibility with hydrophilic resin unpreferably deteriorates so that problems such as deteriorations of a solubility for organic solvent and of a film surface condition upon a film processing are caused.

[0012] Examples of an isocyanate compound used for cross-linking a polyalkylene oxide and a diol above-mentioned may include an organic

compound having two isocyanate groups within a molecule, for example, xylylene diisocyanate (XDI), 4, 4'-diphenylmethane diisocyanate (MDI), hexamethylene diisocyanate, 1,8-dimethylbenzol-2, 4-diisocyanate, 2, 4-tolylene diisocyanate (TDI), a trimer of TDI, polymethylene polyphenyl isocyanate, urethane isocyanate compound that is obtained by reacting polyol such as trimethylolpropane with diisocyanate where the mole number of the diisocyanate corresponds to the active hydrogen number of the polyol, and polyisocyanate adduct, etc. Preferably, 4, 4'-diphenylmethane diisocyanate (MDI), hexamethylene diisocyanate and 2, 4-tolylene diisocyanate (TDI), etc. are used.

[0013] With respect to amounts of the above-mentioned polyalkylene oxide, diol and isocyanate compound, a ratio (R value) of the number of isocyanate groups of the isocyanate compound to the total number of terminal hydroxyl groups of polyalkylene oxide and hydroxyl groups of diol ($\text{-NCO groups} / \text{-OH groups}$) is within the range of 0.5 to 2.0, preferably 0.8 to 1.7. When a R value is less than 0.5, unpreferably a cross-linking density become low so that a gel having a good water absorption efficiency is not obtained. When a R value exceeds 2.0, unpreferably a cross-linking density and a melt viscosity become high so that a processability deteriorates, a solvent-solubility become low and a problem in compatibility with other resins is arisen.

[0014] The mole number of polyalkylene oxide can be calculated by dividing its weight by its weight-average molecular weight. In case of adding a diol, the diol is added when cross-linking polyalkylene oxide and an isocyanate compound. By adding diol, a melt viscosity of a cross-linked polyalkylene oxide obtained can be reduced so that a processability becomes improved. A usage of the above-mentioned isocyanate compounds varies according to kinds of isocyanate compounds and reaction conditions. Generally, a usage range of an isocyanate compound is within the range of 0.5 to 80 parts by weight,

preferably 1 to 50 parts by weight per 100 parts by weight of polyalkylene oxide. When a usage amount of an isocyanate compound is less than 1 part by weight, unpreferably a density of cross-linked polyalkylene oxide obtained becomes low, and then a film having sufficient strength is not obtained. When a usage amount of an isocyanate compound exceeds 80 parts by weight, unpreferably a cross-linking density of cross-linked polyalkylene oxide obtained become too high, a solvent-solubility become low, a processability deteriorates and a problem in compatibility with other resins is arisen.

[0016] Examples of a hydrophilic resin used in the present invention may include a film-formable resin soluble in organic solvents, especially soluble in alcohol or alcohol / water. Especially, a hydrophilic resin other than a polyamide resin is preferably used. Specifically, a vinyl pyrrolidone-vinyl acetate copolymer resin, a polyvinyl butyral resin, a polyvinyl acetal resin, a polyvinyl pyrrolidone resin, a hydroxypropyl cellulose resin, a polyvinyl acetate resin, an ethyl cellulose resin, an ethyl hydroxyethyl cellulose resin, a vinylmethyl ether-maleic anhydride copolymer resin, an ethylene vinyl alcohol resin, a phenol resin, a resorcinol resin and an acrylic resin, etc. are included. Especially, a vinyl pyrrolidone-vinyl acetate copolymer resin and a polyvinyl butyral resin are compatible to a cross-linked polyalkylene oxide resin, and thus these resins are preferably used. As a vinyl pyrrolidone-vinyl acetate copolymer resin, a resin in which vinyl pyrrolidone is contained in an amount of 20 to 80 % by weight is preferably used. As a polybutyral resin, a resin with a polymerization degree of 200 to 3000 is preferably used. An addition proportion of a hydrophilic resin is within the range of 80 to 5 % by weight, preferably 70 to 10 % by weight. When an addition proportion is less than 5 % by weight, unpreferably a heat-and moisture-resisting property and a water-resisting property can not be sufficiently improved. When an addition proportion thereof exceeds 80 % by weight, unpreferably an ink absorption property become low so that a clear picture is not obtained.

[0017] A resin composition for recording materials of the present invention can be obtained by dissolving a cross-linked polyalkylene oxide resin and a hydrophilic resin in different organic solvents and mixing the obtained two resin solutions, or by kneading both resins with an extrusion machine, a kneader and a roll, etc., and then dissolving kneaded resin in a solvent. As the above-mentioned solvent, a single solvent or a mixed solvent selected from methanol, ethanol, n-propanol, iso-propanol, butanol, ethyl acetate, butyl acetate, acetone, cyclohexanone, methyl ethyl ketone, methyl isobutyl ketone, methyl cellulose, tetrahydrofuran, dimethylformamide and toluene, etc., and a combination of these solvents may be used as appropriately. In this case, by further adding a small amount of water to such a solvent, a stability of such a solution may be improved. An addition proportion of water is usually within the range of about 1 to 40%. When an addition proportion of water exceeds 40%, unpreferably a viscosity of such a solution increases.

[0018] A resin composition having been obtained by dissolving the above-mentioned resins in solvent can be formed into an ink fixing layer by applying it to a substrate such as a transparent plastic film and a cellulose derivative substrate, etc. Examples of this transparent plastic film may include polyethylene terephthalate, polypropylene, polyethylene, an ethylene-vinyl acetate copolymer, an ethylene-ethyl acrylate copolymer, an ethylene-methacrylate copolymer, an ethylene-acrylic acid ester-maleic anhydride copolymer, polyamide and polyvinyl chloride, etc. Further, to improve an adhesive property of such a film, a surface treatment may be applied to such a film. Particularly, in a use that does not require transparency, the resin composition can also be applied to a colored plastic film and various papers such as a high-quality paper and a synthetic paper, etc. In addition, a resin composition obtained by kneading a cross-linked polyalkylene oxide resin and a hydrophilic resin with an extrusion machine, a kneader and a roll, etc can

also be formed into a sheet on a plastic film as a support according to an inflation multilayer-molding process or a heat lamination process such as a T-die extrusion method.